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Wind power and the power market

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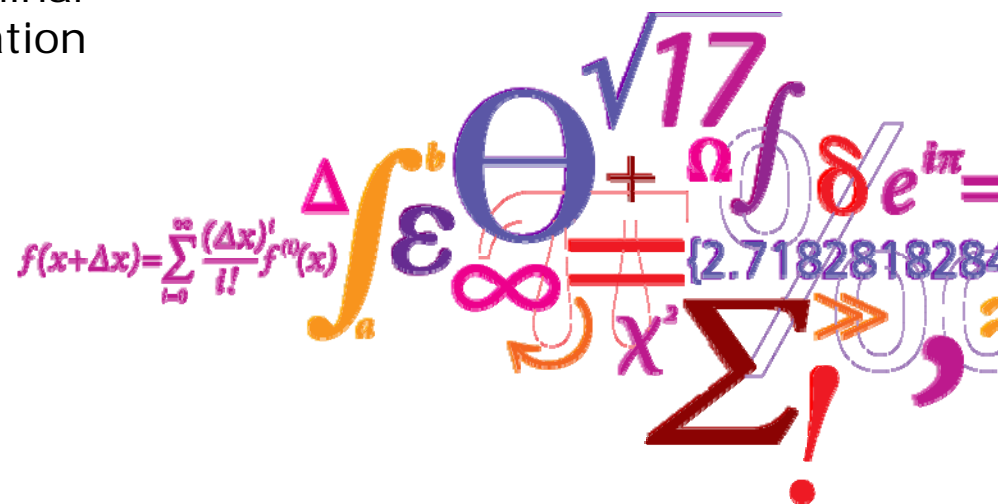
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Wind power and the power market

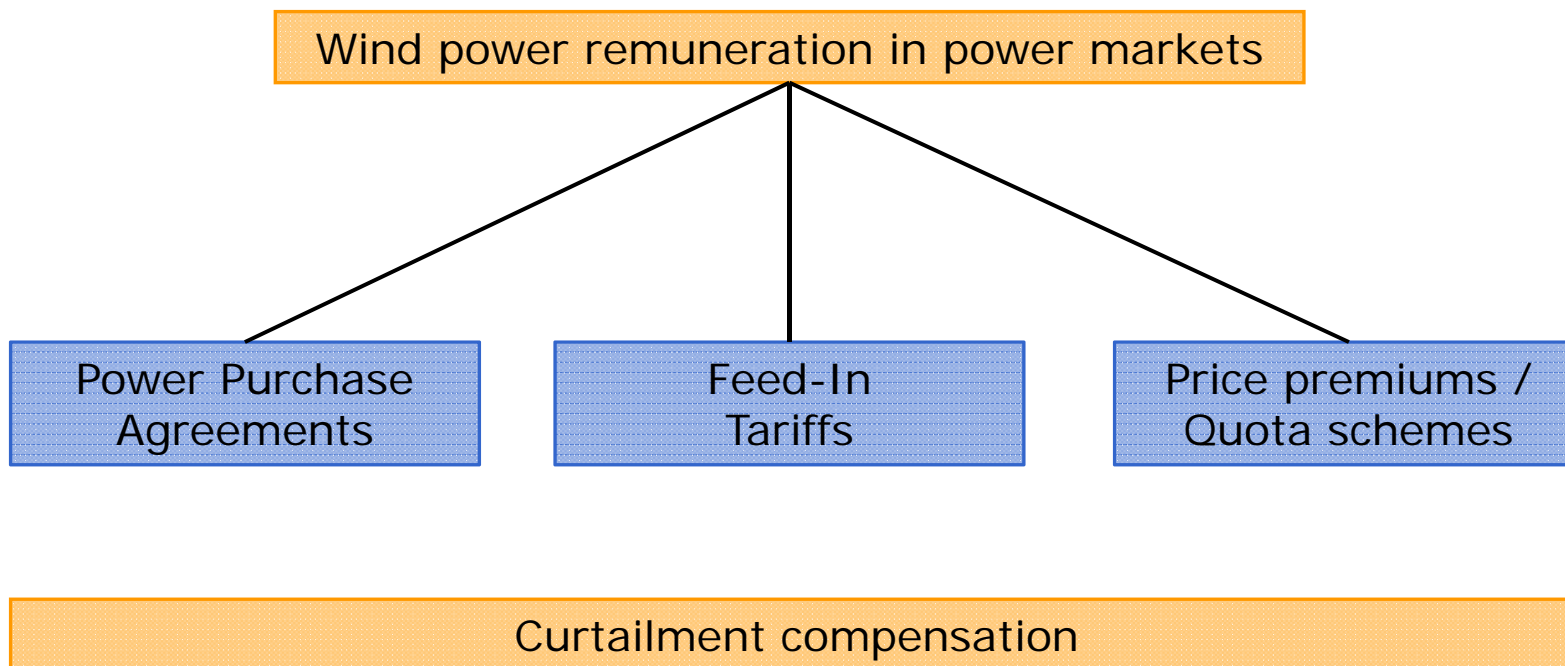
Sascha T. Schröder

EWEA2012 Pre-Conference Grid Seminar
by the Danish Wind Industry Association

April 15th, 2012



Outline



Power Purchase Agreements – Definition

Criterion

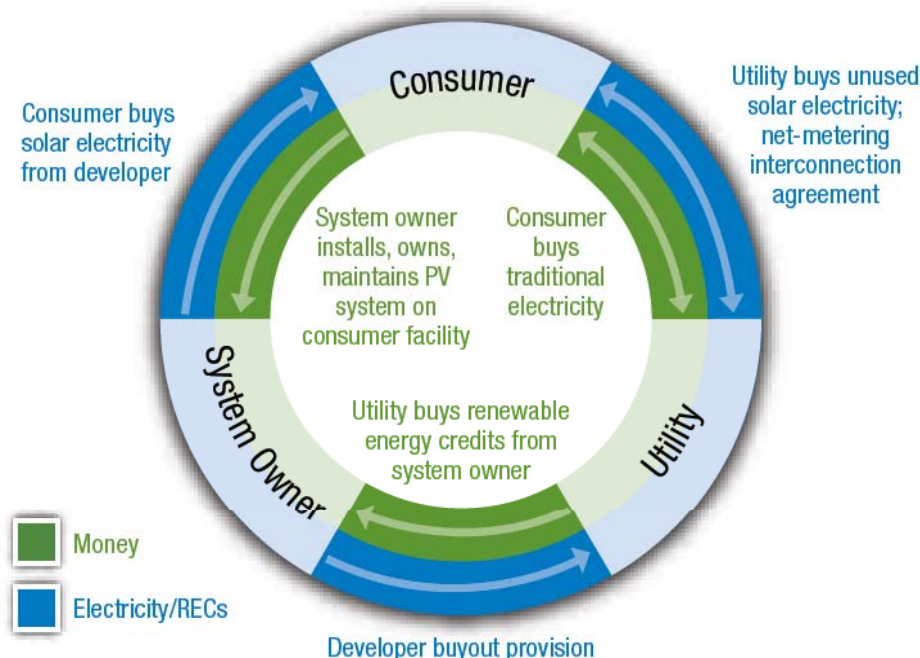
Duration

Tariff

- fixed price/kWh
- fixed escalator price/kWh

Financing

- attractive if increasing tariff rates are expected
- combination with net metering
- comparatively positive impact on network
- transaction costs: favours larger projects



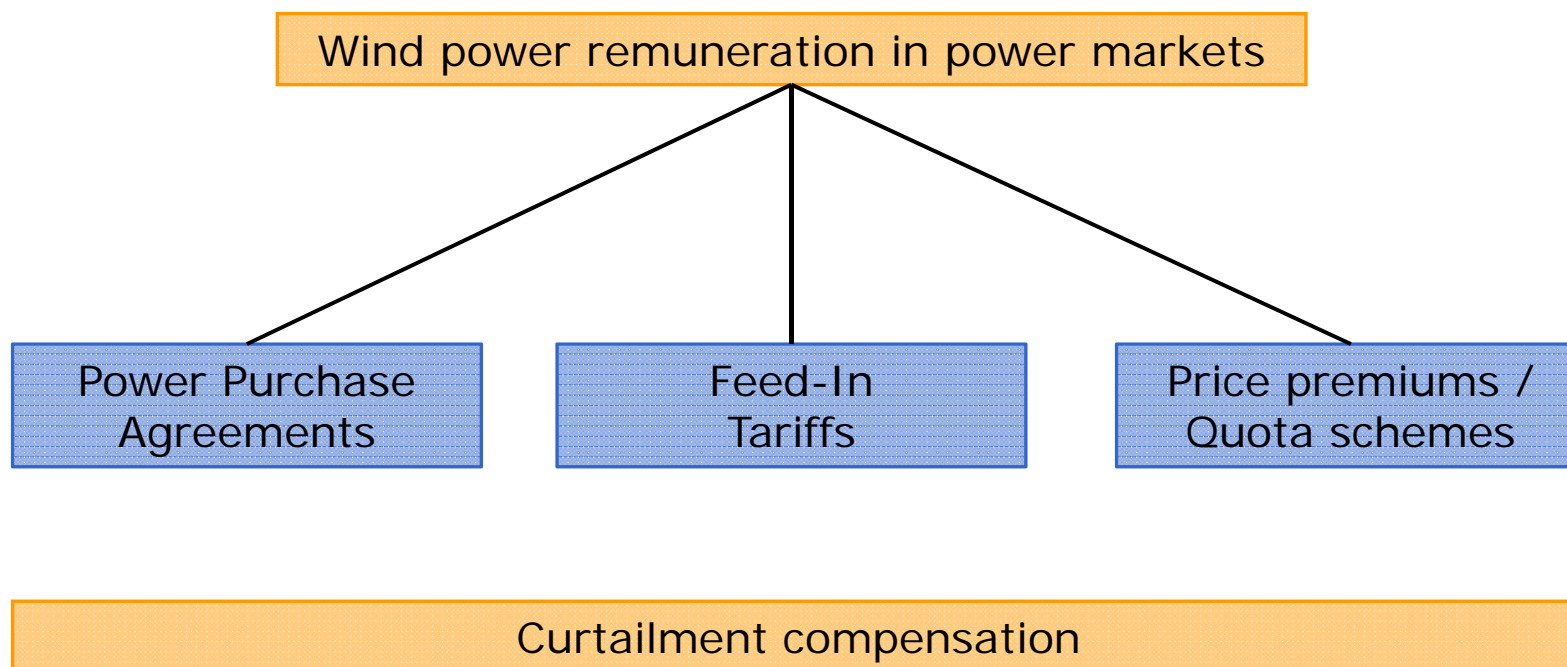
Source: NREL

Power Purchase Agreements – Best practice



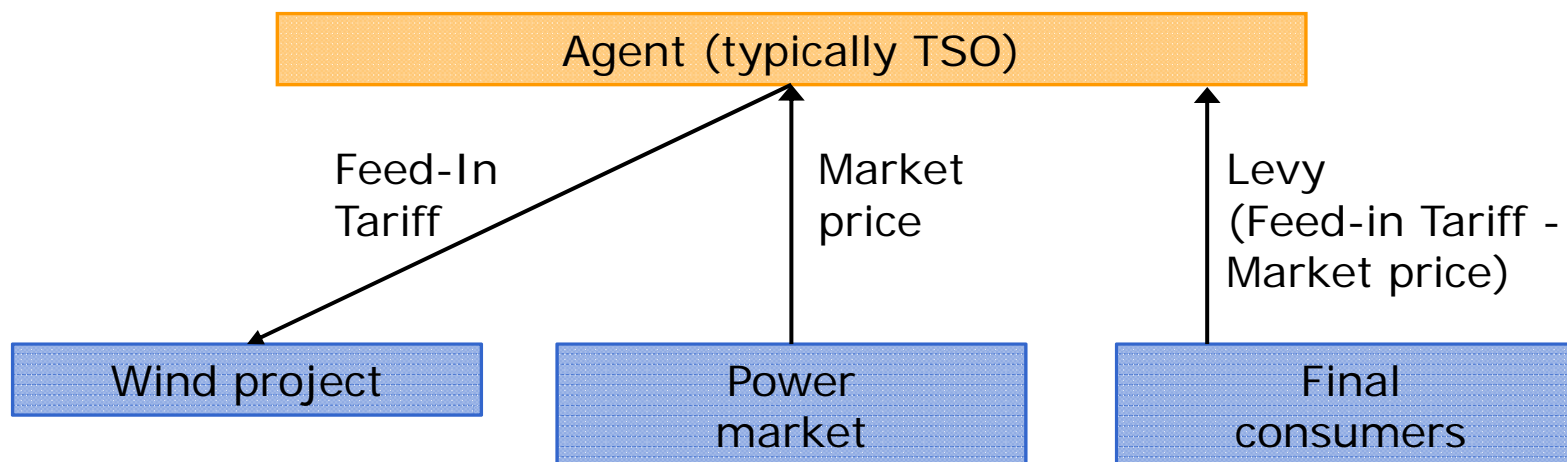
Criterion	Best practice
Duration	e.g. 15, 20 or 25 years
Tariff <ul style="list-style-type: none">•fixed price/kWh•fixed escalator price/kWh	escalator e.g. driven by inflation or expected tariff increases
Financing <ul style="list-style-type: none">•attractive if increasing tariff rates are expected•combination with net metering•comparatively positive impact on network•transaction costs: favours larger projects	<ul style="list-style-type: none">•provide planning security to project developers!•for small-scale applications•set locational incentives and publish them, if possible•shallow connection charges: project developer pays only equipment to connection point

Outline



Feed-In Tariffs

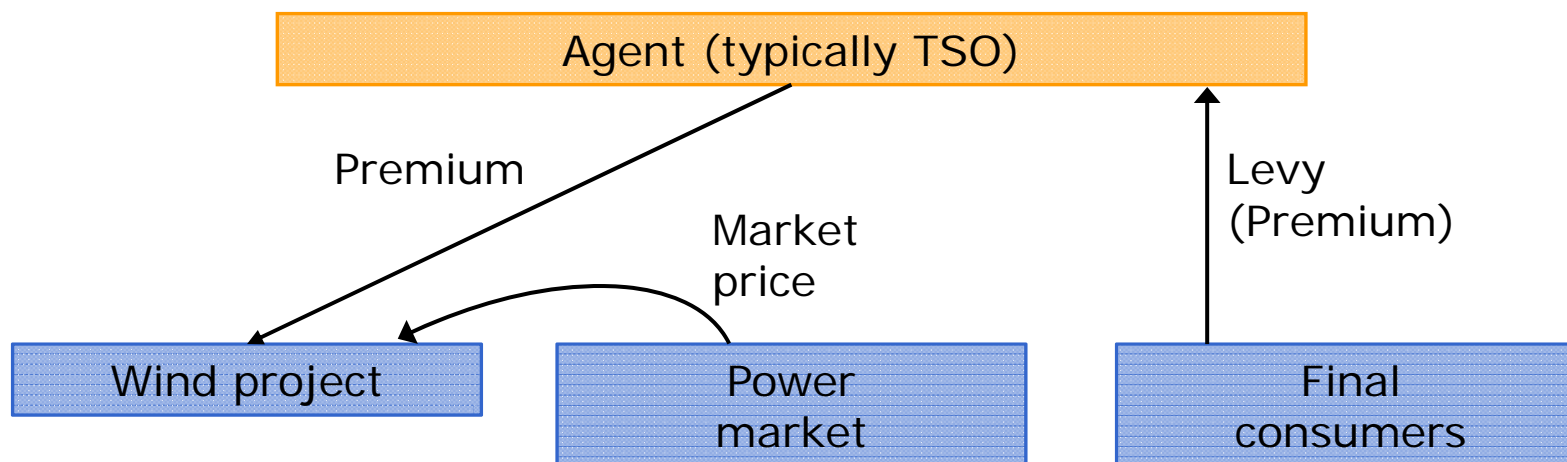
- fixed tariff/kWh over specific time period



- fit for early and mid-penetration markets
- balancing of forecast errors done centrally by TSO
 - good tools, multiple tools combined
- technical connection rules (network stability) adjusted for wind penetration level
- locational incentives could be set via connection charges – but keep them shallow

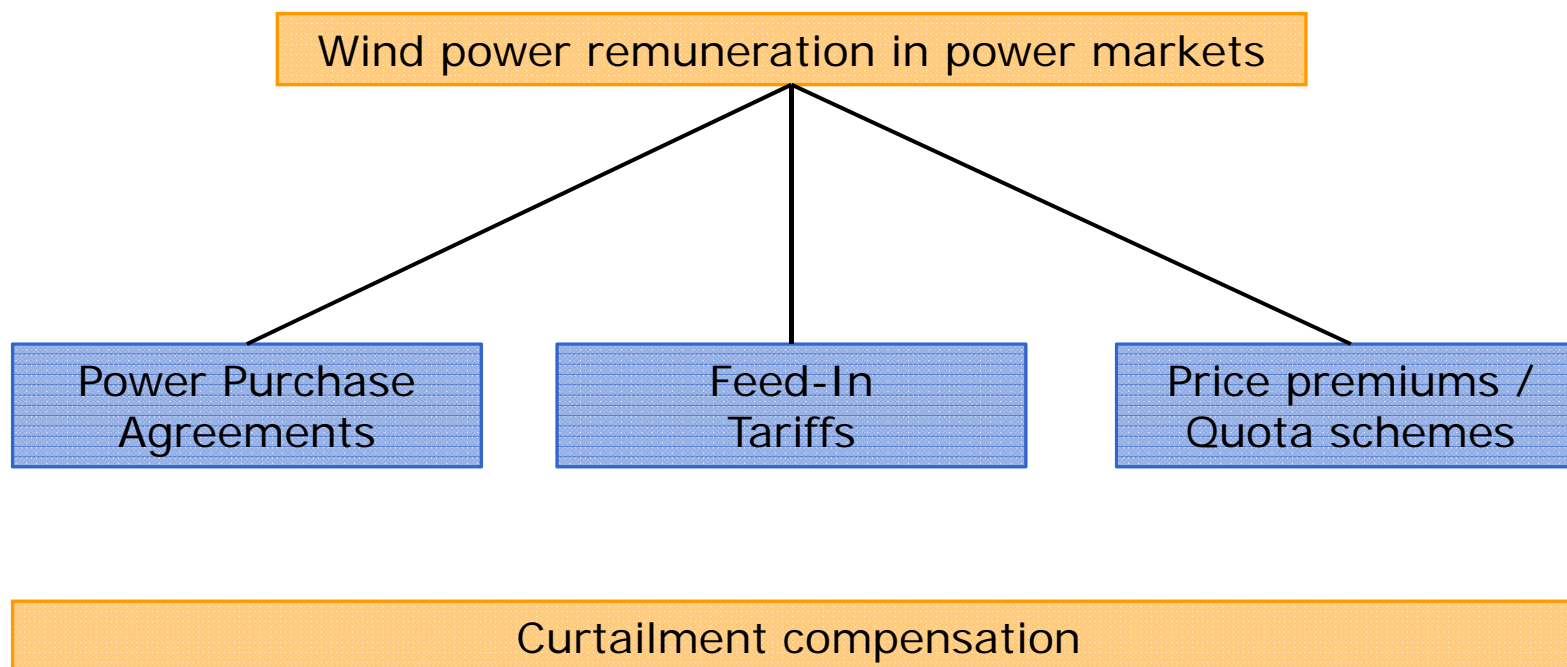
Price premiums / quota schemes

- fixed premium/kWh or variable quota price/kWh over specific time period



- fit for mature markets and high penetration levels
- risk premiums from developers' point of view
- balancing of forecast errors done centrally by single actors
- technical connection rules (network stability) adjusted for wind penetration level
- locational incentives could be set via connection charges – but keep them shallow

Outline



Curtailment

- 2 types of curtailment
 - involuntary: reduced generation due to e.g. grid problems
 - voluntary: reduced generation due to power market signals
- static conditions: network capacity that can absorb all generation is overdimensioned (e.g. offshore)
- contractual agreement on a maximum number of curtailment hours possible
 - part of a PPA / network connection agreement
 - also as locational signal
 - otherwise: compensation at outgone income level
 - curtailment agreements need to be regulated

Food for thought & discussion

- connection conditions: transparent & foreseeable, technical specifications adjusted to wind penetration level
- Power Purchase Agreements
 - value of power
 - insurance function against rising fuel prices
 - impact on network, possible impact after network extensions
- General:
 - proactive approach to wind integration
 - shallow connection charges
 - optimal curtailment level
 - curtailment compensation

Thank you for your attention!

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